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Differential Equations of Controlled Pneumatic Actuators for 6-DOF Stewart Platform

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Abstract: In the paper, the differential equations of the controlled pneumatic actuators as a part of simulator for training drivers of freight vehicles based on 6-DOF Stewart Platform are presented. The sliding-mode control strategy is proposed and studied by simulations. The experimental results for the existing on-off logical control algorithm are given, showing potential advantage of the sliding-mode controller for tracking fast reference signals.

Keywords: *Stewart platform; control; pneumatic actuator; nonlinear dynamics.*

Mathematics Subject Classification (2010): 00A06, 00A69, 00A72, 03C98, 34L30.

1 Introduction

The present paper is devoted to designing a simulator for training of freight KamAZ vehicle drivers. The simulator is currently under construction by the Transas Co. The car cab is mounted on the Gough–Stewart platform for reproducing the desired motions of the cab. The distinguish feature of the simulator is employing pneumatic servo as actuators.

Pneumatic systems are widely used in many applications, but the control of such systems poses difficult problems due to the nonlinear behavior of friction-like phenomena and great variation of the system properties associated with the system state.

During the last decades, the control/tracking problem for pneumatic actuators has been extensively studied in the literature. The authors of [1] presented results on the

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